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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/380,864	12/02/1999	MARTYN VINCENT TWIGG	JMYT-V00200	3166

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EXAMINER	
LEUNG, JENNIFER A	

ART UNIT	PAPER NUMBER
1764	

DATE MAILED: 11/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/380,864	TWIGG, MARTYN VINCENT
	Examiner	Art Unit
	Jennifer A. Leung	1764

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 October 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *9-12,14-16,18,21-30,32,34 and 35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *9-12,14-16,18,21-30,32,34 and 35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action, submitted on October 22, 2004, is persuasive and, therefore, the finality of that action is withdrawn. Claims 1-8, 13, 17, 19, 20, 31 and 33 are cancelled. Claims 9-12, 14-16, 18, 21-30, 32, 34 and 35 remain active.

Response to Arguments

2. Applicant's arguments with respect to claims 9-12, 14-16, 18, 21-30, 32, 34 and 35 have been fully considered but are moot in view of the new ground(s) of rejection, below.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 9-12, 14-16, 18, 21-30, 32, 34 and 35 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Regarding claims 9 and 21, it is unclear as to where the limitation, "wherein the platinum is present in the lean NOx catalyst system at a loading of $\preceq$ 30 g/ft^3," (claim 9, lines 13-14; claim 21, lines 11-12), is located in the applicant's specification, since the specification only shows support for a Pt loading of *less than* 30 g/ft^3 (page 2, lines 26-28), and not a Pt loading of *less*

than or equal to 30 g/ft^3. Furthermore, it is unclear as to where the limitation, "wherein the volume of the lean NOx catalyst system is 300% or greater than that of the volume of the oxidation catalyst system," (claim 9, lines 4-15; claim 21, lines 12-13), is located in applicant's specification, since the specification only shows support for a volume of lean NOx catalyst system *at 300%* the volume of the oxidation catalyst system (page 7, Table 3, system (5)), and not a volume of lean NOx catalyst system *at 300% or greater* than that of the volume of the oxidation catalyst system.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 9-16, 21-30, 34 and 35 are rejected under 35 U.S.C. 103(a) as obvious over Tsuchitani et al. (EP 0 666 099) in view of Shiraishi et al. (JP 03-094818).

Regarding claims 9, 14, 21, 26, 34 and 35, Tsuchitani et al. discloses a combination of a lean burn engine (i.e., a gasoline or diesel engine, a boiler, etc. that generates exhaust gas under an oxidizing or air-rich atmosphere; page 3, lines 1-33; page 4, lines 1, 2 and 27-35; page 5, lines 23-26) and an emission control system, said emission control system comprising:

a) a lean NO_x catalyst system comprising a platinum group metal (PGM) for reducing NO_x to N_2, wherein the PGM consists of platinum (page 7, lines 47-55);

b) an oxidation catalyst system comprising a PGM, such as platinum, for oxidizing hydrocarbons and carbon monoxide, disposed downstream from the lean NO_x

catalyst system (page 9, lines 38-44); and

c) means for injecting hydrocarbon fuel into the exhaust upstream of the lean NO_x catalyst system (page 5, lines 27-41);

wherein the platinum metal is present in the lean NO_x catalyst system at a loading of less than 30 g/ft^3 (i.e., generally, 0.1 to 30 grams Pt per liter of catalyst, or preferably, 0.5 to 5 grams Pt per liter of catalyst; page 7, line 56 to page 8, line 9).

Additionally, Tsuchitani et al. (page 4, line 6 to page 5, line 14; see claims) discloses a process for controlling the emissions from said lean burn engine, above, said process comprising:

a) passing exhaust gases from the engine over said lean NO_x catalyst system;

b) passing the product gases exiting from the lean NO_x catalyst system over said oxidation catalyst system; and

c) introducing additional hydrocarbon fuel into the exhaust gas upstream of said lean NO_x catalyst system.

Tsuchitani et al. (page 7, lines 37-46) suggests that the reactivity as manifested by a given catalyst directly relates the space velocity of the exhaust gas relative to the catalyst bed, and hence, the reactivity as manifested by the catalyst is also a function of the catalyst volume.

> "... the space velocity (S.V.) of the exhaust gas under treatment relative to the catalyst bed is preferable to be in the range of 1,000 to 300,000/hr, preferably 10,000 to 200,000/hr. *If the space velocity exceeds 300,000/hr, the catalyst will manifest ample reactivity with difficulty. Conversely, if it falls short of 1,000/hr, the catalyst will have to be increased in volume*, and moreover, the diffusion in the flow path of gas will bring about the influence of nullifying the effect of intermittently introducing the reducing substance or imparting a reducing atmosphere to the exhaust gas."

However, Tsuchitani et al. is silent as to the volume of the lean NO_x catalyst system being, specifically, 300 % or greater than that of the volume of the oxidation catalyst system.

Shiraishi et al. teaches a catalytic converter for purifying an exhaust gas stream containing hydrocarbons, CO and NOx, wherein the converter comprises an inlet side (upstream) catalyst bed A and an outlet side (downstream) catalyst bed B. The inlet side catalyst bed A comprises a PGM metal such as rhodium, platinum or palladium, and the outlet side catalyst bed B comprises a PGM metal such as palladium and rhodium (page 112, bottom left column; Abstract). In particular, the volume ratio of the inlet side catalyst A to the outlet side catalyst B (A:B) is controlled to lie within the range of 8:1 to 1:3 (Abstract). Shiraishi et al. teaches that by controlling the volume ratio of A:B within said range, the purification capacity of the converter is improved, especially when the air-to-fuel ratio of the exhaust gas stream is high, under high temperatures (page 113, bottom right column; also, see example on page 114, second table; Abstract).

It would have therefore been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate volume for the lean NO_x catalyst system relative to the oxidation catalyst system (i.e., such as the claimed ratio of at least 3:1, lean NOx catalyst-to-oxidation catalyst) in the process and apparatus of Tsuchitani et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because controlling the volume ratio of the two systems within said range improves the purification capacity of the converter, especially when the air-to-fuel ratio of the exhaust gas stream is high under high temperatures, as taught by Shiraishi et al., above. Additionally, the precise volume ratio of the lean NO_x catalyst system to the oxidation catalyst system would have been considered a result effective variable by one having ordinary skill in the art, as evidenced by Shiraishi et al. (i.e., see page 114, tables 1 and 2). Accordingly, one having ordinary skill in the art would have routinely

optimized the volume of catalyst in the lean NO_x catalyst system relative to the volume of catalyst in the oxidation catalyst system in order to obtain a desired total conversion of hydrocarbons, CO and NO_x in the emission control system. *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980). Also, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering optimum or workable ranges involves routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 10, 11, 22 and 23, Tsuchitani et al. is silent as to whether the NO_x catalyst has an activity sufficient to provide a ratio of % NO_x to % HC conversion of at least 0.2, or whether the oxidation catalyst has an activity sufficient to provide a % HC conversion greater than 80% and a % CO conversion greater than 70%, as measured under the testing conditions of 230 °C, a space velocity of 25,000 hr^{-1} and a HC:NO_x input ratio of 3:1 counting the HC as equivalent propane. In any event, the modified system and method of Tsuchitani et al. meet the claims, since although the instantly claimed conversion rates for the given testing conditions are not specifically disclosed, a newly discovered property does not necessarily mean the product is unobvious, since this property may be inherent in the prior art. *In re Best 195 USPQ 430 (CCPA 1977); In re Swinehart 169 USPQ 226 (CCPA 1971).* The modified system and process of Tsuchitani et al. substantially comprises each of the elements of the instantly claimed invention and therefore one of ordinary skill in the art would not expect a different and/or unexpected result to be obtained. Furthermore, it would have been an obvious design choice for one of ordinary skill in the art at the time the invention was made to select an appropriate temperature, space velocity and input ratio for the catalyst system evaluation on the basis of suitability for the intended use, since what is recited is merely a testing condition, and where the general conditions

of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller, 105 USPQ 233.*

Regarding claims 12, 13 and 24, Tsuchitani et al. discloses the lean NOx catalyst system may further comprise an alkaline earth metal (i.e., beryllium, magnesium, calcium, strontium barium, or a compound of the metal; page 7, lines 47-55).

Regarding claims 15 and 27, Tsuchitani et al. discloses the oxidation catalyst system PGM loading is about 100 g/ft^3 (i.e., "... the noble metal to be preferable is desired to be in the range of 0.1 to 5 g per liter of the catalyst," page 9, line 55 to page 10, line 19).

Regarding claims 16 and 28, Tsuchitani et al. discloses the oxidation or lean NO_x catalyst system further comprise alumina, ceria or zirconia (page 8, line 33 to page 9, line 1).

Regarding claim 25, Tsuchitani et al. discloses the oxidation catalyst system further comprises a base metal (i.e., iron, nickel; page 9, line 55 to page 10, line 19).

Regarding claim 29 and 30, Tsuchitani et al. (page 7, lines 37-46) discloses,

> "... the space velocity (S.V.) of the exhaust gas under treatment relative to the catalyst bed is preferable to be in the range of 1,000 to 300,000/hr, preferably 10,000 to 200,000/hr. If the space velocity exceeds 300,000/hr, the catalyst will manifest ample reactivity with difficulty. Conversely, if it falls short of 1,000/hr, the catalyst will have to be increased in volume, and moreover, the diffusion in the flow path of gas will bring about the influence of nullifying the effect of intermittently introducing the reducing substance or imparting a reducing atmosphere to the exhaust gas."

Accordingly, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select the claimed space velocities in the method of Tsuchitani et al., because the specific space velocities would have been considered a result effective variable, and one having ordinary skill in the art would have routinely optimized the space velocity for each of the lean NO_x catalyst system and oxidation catalyst system on the basis of the desired catalytic

reactivity. *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980). Furthermore, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

5. Claims 18 and 32 are rejected under 35 U.S.C. 103(a) as obvious over Tsuchitani et al. (EP 0 666 099) in view of Shiraishi et al. (JP 03-094818), as applied to claims 9 and 21 above, and further in view of Fukui et al. (U.S. 5,474,745).

Tsuchitani et al. is silent as to providing the lean NOx catalyst system as two catalytic substrates arranged in parallel. Fukui et al. teach an apparatus for reducing NO_x in exhaust gas from a diesel engine comprising an NO_x reducing catalyst coated on two substrates arranged in parallel (FIG. 15; column 11, lines 34-44). It would have been obvious for one of ordinary skill in the art at the time the invention was made to configure the NO_x catalyst as such in the modified system and process of Tsuchitani et al. because such arrangement improves the heat release ability of the substrate in comparison to a larger converter, as taught by Fukui et al. "In order to increase the conversion efficiency for reducing NO_x in the exhaust gas... it is important to keep temperatures of the gas and catalyst from increasing by releasing the exothermic heat to the outside immediately," (column 4, lines 3-11).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for

the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer A. Leung
November 3, 2004

Hien Tran

HIEN TRAN
PRIMARY EXAMINER